

CLAIMS

1. A syringe comprising:

an outer tube provided on the tip end side thereof with a mouth portion permitting a liquid to come in and out therethrough;

a gasket slidable in said outer tube;

a pusher connected to said gasket and operated to move said gasket in the longitudinal direction of said outer tube;

a ventilation means provided in said pusher; and

a sealing member sealing a base end opening of said outer tube and having an insertion hole for inserting said pusher therethrough;

wherein a first space surrounded by said outer tube and said gasket and located on the tip end side of said gasket, and a second space surrounded by said outer tube, said gasket and said sealing member and located on the base end side of said gasket are provided in said outer tube, and

before an operation to push said pusher to the tip end direction, said second space is maintained in the state of being shielded (sealed) from the outside air and, when the operation to push said pusher to the tip end direction is performed, the outside air is let into said second space

by said ventilation means.

2. A syringe as set forth in claim 1, wherein said ventilation means is a groove or slit opening to the outer circumferential surface of said pusher.

3. A prefilled syringe as set forth in claim 1, wherein said ventilation means is comprised of a ventilation passage formed inside said pusher to open, at one end thereof, to said outer circumferential surface of said pusher.

4. A syringe as set forth in claim 1, wherein said ventilation means is a rib formed on said outer circumferential surface of said pusher.

5. A syringe as set forth in any of claims 1 to 4, wherein the pressure difference $P_1 - P_2$ is not more than 0.9 atm, where P_1 [atm] is the pressure in said second space before the start of the operation to push said pusher to the tip end direction, and P_2 [atm] is the pressure in said second space after said operation to push said pusher to the tip end direction is started and immediately before the outside air is let into said second space.

6. A syringe as set forth in any of claims 1 to 5, wherein the moving distance of said pusher from the time when said operation to push said pusher to the tip end direction is started till the time when the outside air is let into said second space is in the range of 2 to 10 mm.

7. A syringe comprising:

an outer tube provided on the tip end side thereof with a mouth portion permitting a liquid to come in and out therethrough;

a gasket slidably disposed in said outer tube and partitioning the inside of said outer tube into the tip end side and the base end side;

a pusher connected to said gasket and operated to move said gasket in the longitudinal direction of said outer tube;

a ventilation passage formed inside said pusher so as to communicate a second space surrounded by said outer tube, said gasket and said sealing member and located on the base end side of said gasket and the exterior to each other;

a sealing member sealing a base end opening of said outer tube and having an insertion hole for inserting said

pusher therethrough; and

a filter disposed so as to shut off said ventilation passage, and permitting gases to pass therethrough but not permitting bacteria to pass therethrough;

wherein when said pusher is moved to the tip end direction, the outer circumferential surface of said pusher slides while making close contact with at least a part of said insertion hole, and the outside air is let into said space through said ventilation passage.

8. A syringe as set forth in claim 7, wherein at least a portion, in the vicinity of said ventilation hole, of said sealing member is formed of an elastic material.

9. A syringe as set forth in claim 7 or 8, wherein said gasket is provided with a hollow portion opening to a base end face thereof, said pusher is provided at a tip end portion thereof with a head portion to be inserted into said hollow portion, and a tip end opening portion of said ventilation passage is formed in said head portion.

10. A syringe as set forth in claim 9, wherein said filter is provided at said tip end opening portion of said ventilation passage.

11. A syringe as set forth in claim 9 or 10, wherein when said pusher is moved in the longitudinal direction thereof, air is distributed between said space and said ventilation passage through a gap between said head portion and said gasket.

12. A syringe comprising: an outer tube provided on the tip end side thereof with a mouth portion permitting a liquid to come in and out therethrough; a gasket slidably disposed in said outer tube and partitioning the space in said outer tube into the tip end side and the base end side; and a pusher connected to said gasket and operated to move said gasket in the longitudinal direction of said outer tube, wherein

said pusher comprises a pusher main body, and a pusher operating portion disposed on the base end side of said pusher main body so as to be movable in the longitudinal direction of said pusher,

said pusher operating portion has an abutment portion abutting on a base end portion, or a portion near said base end portion, of said outer tube in the condition where the length of said pusher is small, and

in the condition where the length of said pusher is

small, said abutment portion abuts on said base end portion, or the portion near said base end portion, of said outer tube, whereby said gasket is prevented from being pushed to a tip end portion of a barrel portion of said outer tube, but in the condition where the length of said pusher is large, said gasket can be pushed to said tip end portion of said barrel portion of said outer tube.

13. A syringe as set forth in claim 12, comprising maintaining means for maintaining the condition where said length of said pusher is large.

14. A syringe as set forth in claim 13, wherein either one of said pusher main body and said pusher operating portion comprises an elastic piece, and a projected portion formed on the opposite side of the base of said elastic piece, while the other of said pusher main body and said pusher operating portion has a recessed portion into which said projected portion can be inserted, and

in the condition where the length of said pusher is large, said projected portion is inserted into and engaged with said recessed portion by the elasticity of said elastic piece, whereby the condition where the length of

said pusher is large is maintained.

15. A syringe as set forth in any of claims 12 to 14, comprising a chemical contained in a space surrounded by said outer tube and said gasket and located on the tip end side of said gasket.

16. A syringe as set forth in any of claims 12 to 15, comprising a plate-like outer tube flange at a base end portion of said outer tube, wherein

said abutment portion abuts on a base end face of said outer tube flange in the condition where the length of said pusher is small.

17. A prefilled syringe comprising a chemical contained in a space on the tip end side of said gasket in a syringe as set forth in any of claims 1 to 16.